REMARKS

Claims 1, 3, 6-8, 10 and 13-14 are pending in this application. Base claims 1, 6 and 13 are believed to be distinguishable over the cited prior art, including Jung, U.S. Patent No. 6,825,493, and Yang, U.S. Publication No. 2002/0197759. As a result, no claim has been amended herein.

The Examiner's several courtesies extended to Applicants' representative during an in-person Office Interview conducted earlier today, February 26, 2008, are noted with appreciation. During the interview, key features of claims 1, 3, 6-8, 10 and 13-14 were discussed relative to the cited prior art, including Jung, U.S. Patent No. 6,825,493 and Yang, U.S. Publication No. 2002/0197759. Unfortunately, an agreement with respect to these claims was not reached. Accordingly to the Examiner, as indicated in the Examiner Interview Summary,

> "Discussed Fig. 3C of Jung et al, which shows a scale of 0.7 micrometers for the length and the width would be extrapolated from the length to be within the claimed range of 0.2-0.6 micrometers. Also, discussed the examiner's position that the mask size for the light transmitting portions and non-light transmission portions would have been obvious to one of ordinary skill in the art in view of Yang et al. The Examiner recommends filing a CFR 1.132 affidavit showing unexpected results for the claim range of grain size compared to the prior art disclosures, otherwise the rejections would be maintained."

In response to the Examiner's recommendation, Applicants are planning to prepare and submit such a 37 CFR §1.32 affidavit to demonstrate unexpected results or superior characteristics relative to the prior art disclosed range. However, given the due date for filing a response to the outstanding Office Action on February 26, 2008, the 37 CFR §1.32 affidavit shall be prepared and submitted in due course to expedite allowance of the application.

Turning now to the substance of the final Office Action, claims 1, 3 and 13-14 stand finally rejected under 35 U.S.C. §102(b) as being anticipated by Jung, U.S. Patent No. 6,825,493, or in the alternative, under 35 U.S.C. §103(a) as being unpatentable over the same Jung, U.S. Patent No. 6,825,493 for reasons stated on pages 2-4 of the final Office Action. In support of this rejection, the Examiner cites column 9, lines 45-67; column 10, lines 25-45; and column 14, lines 1-25 of Jung '493 for allegedly disclosing Applicants' claimed "<u>width of the overlapping region</u> during crystallization corresponds to the distance, and <u>is varied from no less</u>

than 0.5 µm to 2 µm," and "the average width of the polycrystalline silicon grains is varied between approximately 0.2 µm and 0.6 µm, and "is decreased when the width of the overlapping region on which the laser beam is overlappingly irradiated is decreased" as defined in base claims 1 and 13.

Again, as previously discussed in paragraph [0009] of Applicants' specification, the problem as identified by Applicants relates to the deterioration of the mobility of an electric field by a scattering effect during charge transfer if an average width of the polycrystalline silicon grains is not at the correct size. As a result, polycrystalline silicon grains having an average width of a certain size is important, and is required to obtain superior current characteristics. These problems are remedied by Applicants' sole recognition that, if a laser beam is overlappingly irradiated at an overlapping region on the substrate where amorphous silicon and a part of already crystallized polycrystalline silicon are exposed, and a width of the overlapping region during crystallization is varied between 0.5 µm and 2 µm, the **most effective width of polycrystalline silicon grains, that is, from 0.2 µm and 0.6 µm,** can be advantageously obtained as the width of the overlapping region on which the laser beam is overlappingly irradiated is decreased.

In contrast to Applicants' base claims 1 and 13, Jung '493 addresses an improvement relative a conventional sequential lateral solidification (SLC) crystallization method in which a substrate 38, as shown in FIG. 2, is moved numerous times and different masks are used for different areas, i.e., TFT area and driving circuit area. Evidently, in the conventional SLC crystallization method, two different masks are traditionally used, i.e., one mask having closely spaced slits is used to fabricate switching circuits, such as **TFTs**, and another mask having wider spaced slits is used to fabricate the driving circuits, such as **CMOS devices**. However, as Jung '493 has identified, on column 5, lines 12-16,

> "using the different mask for the driving circuit, however, causes increasing the cost of production."

According to Jung '493, the improvement is to utilize only one mask to fabricate both the switching circuits, such as, TFTs, and the driving circuits, such as, CMOS devices, in order to reduce the process time and to improve production. Such a mask 130 is shown in FIG. 5, including light transmitting portions 132 and light absorptive portions 134. Each light transmitting portion 132 has a width of 2 micrometers (µm). Each light absorptive portion 134 has a width of

10 micrometers (µm). Such a mask 130 is used differently depending upon whether the crystallization process is utilized for the driving circuits, i.e., **CMOS devices**, as shown in FIGs. 6A-6D, or alternatively, for the switching circuits, i.e., **TFTs**, as shown in FIGs. 7A-7D.

For example, in the embodiment shown in FIGs. 6A-6D, the mask 130 is used to move along the lateral grain growth of the grains (see FIG. 6A) in a X-direction by a <u>distance of about 0.7 micrometers</u> (see column 9, lines 54-55 of Jung '493) during the fabrication of the driving circuits, i.e., **CMOS devices**. As a result, the polycrystalline silicon grains are obtained with a <u>width "P" of 12 micrometers</u> (see column 10, lines 8-10 of Jung '493).

In the embodiment shown in FIGs. 7A-7D, the mask 130 is used to move in a X-direction by a <u>distance of about 1.7 micrometers</u> (see column 10, lines 40-41 of Jung '493) during the fabrication of the switching circuits, i.e., **TFTs**. As a result, the resulting grains are obtained with a width of 1.7 micrometers (see column 10, lines 64-65 of Jung '493). According to Jung '493, each grain has a width of about 1.7 micrometers (µm) (see column 10, lines 64-65 of Jung '493), which is sufficient for the active layers of the TFTs (see column 11, lines 2-5 of Jung '493).

In other words, the smallest width for the polycrystalline silicon grains can be obtained by Jung '493 is 1<u>.7 micrometers (µm)</u>.

Nevertheless, on page 3 of the final Office Action, the Examiner asserts that FIG. 3C of Jung '493 shows "the grains and has a 0.7 µm reference scale and the width between the grains" which is allegedly disclosing Applicants' claimed "<u>average width of the polycrystalline silicon grains is varied between approximately 0.2 µm and 0.6 µm</u>" as defined in base claims 1 and 13. However, the Examiner's assertion is factually incorrect. As described on column 3, lines 55-57 of Jung '493, the reference to the 0.7 µm reference scale, shown in FIG. 3C, refers to the movement of a mask in a transverse direction (i.e., in the x-axial direction) using conventional SLS method.

On page 6 of the final Office Action, the Examiner seems to admit that Jung '493 does not disclose Applicants claimed "<u>average width of the polycrystalline silicon grains is varied between approximately 0.2 µm and 0.6 µm</u>" as defined in base claims 1 and 13. Nevertheless, the Examiner argues that Jung '493 anticipates this feature because,

> "Jung teaches moving the mask by a distance of 0.7 and 1.7 µm (col. 9, ln 50-60 and col 10, ln 30-50) and this corresponds to the regions which are already exposed, this reads on applicant's width of the overlapping region corresponds to the distance and is varied between 0.5-2 µm."

However, this line of argument is actually contrary to the teaching of Jung '493. As previously discussed, Jung '493 does **not** disclose or teach moving the mask from a distance of 0.7 µm to 1.7 µm, as alleged by the Examiner.

Rather, Jung '493 discloses moving the mask at different translation distances for different crystallization processes for different types of devices, i.e., switching circuits, such as **TFTs**, and driving circuits, such as **CMOS devices**. For example, during the crystallization of the driving circuits, i.e., **CMOS devices**, as shown in FIGs. 6A-6D, the mask 130, as shown in FIG. 5, is moved by a distance of 0.7 µm so that polycrystalline silicon grains shall exhibit a width "P" of 12 micrometers (see column 10, lines 8-10 of Jung '493). In contrast, during the crystallization of the switching circuits, i.e., **TFTs**, as shown in FIGs. 7A-7D, the mask 130, as shown in FIG. 5, is moved by a distance of 1.7 µm so that polycrystalline silicon grains shall exhibit a width of 1.7 micrometers (see column 10, lines 64-65 of Jung '493).

In other words, during the crystallization of the CMOS devices on active area of a substrate, the mask is moved by a distance of 0.7 µm. After the CMOS devices are fabricated, the mask is then moved by a distance of 1.7 µm during the crystallization of TFTs on a different area of a substrate.

Again, there is **no** disclosure or suggestion anywhere from Jung '493 of Applicants claimed "average width of the polycrystalline silicon grains is varied between approximately 0.2 µm and 0.6 µm" as defined in base claims 1 and 13.

On page 7 of the final Office Action, the Examiner further asserts that Jung '493 teaches

> "adjusting the mask movement distance (co 14, ln 10-20), thus the width of the overlap decreases because the movement distance changed. The decreasing of the average width of the grain limitation is merely a claimed effect of varying the amount of overlap, thus is taught Jung."

Again, this assertion is incorrect. According to Jung '493, the mask is not and cannot be adjusted, as alleged by the Examiner, during the crystallization process. Rather, such a mask is moved at a different distance for different crystallization processes used for different types of devices on a substrate, i.e., switching circuits, such as **TFTs**, and driving circuits, such as **CMOS devices**. As a result, the width of the overlap does not decrease because the movement distance changed, as alleged by the Examiner.

Again, and as previously discussed, there is **no** disclosure from Jung '493 nor is there any teaching or suggestion of the Applicants' claimed "transversely moving the mask relative to the substrate by a translation distance such that the laser beam is overlappingly irradiated at an overlapping region on the substrate where amorphous silicon and a part of already crystallized polycrystalline silicon are exposed so as to increase an average width of the polycrystalline silicon grains," such that, when "a width of the overlapping region during crystallization corresponds to the translation distance, and is varied from no less than 0.5 μm to 2 μm", "an average width of the polycrystalline silicon grains is varied between approximately 0.2 μm and 0.6 μm, and is decreased when the width of the overlapping region on which the laser beam is overlappingly irradiated is decreased" as expressly defined in base claims 1 and 13.

In addition, Jung '493 does **not** disclose or suggest the distinction between the light transmission portion and the light non-transmission portion of the mask in which a width of the light transmission portion is larger than a width of the light non-transmission portion by at least 1 μm, as defined in base claim 13.

Since Jung '493 fails to disclose and suggest key features of Applicants' base claims 1 and 13, Applicants respectfully request that the rejection of claims 1, 3 and 13-14 be withdrawn.

Nevertheless, as previously discussed with reference to the in-person Office Interview, the Examiner has evidently based the §102/103 rejection of claims 1, 3 and 13-14 on the background discussion of Jung '493. Specifically, the Examiner notes, as indicated in the Examiner Interview Summary, that

> "Discussed Fig. 3C of Jung et al, which shows a scale of 0.7 micrometers for the length and the width would be extrapolated from the length to be within the claimed range of 0.2-0.6 micrometers. Also, discussed the examiner's position that the mask size for the light transmitting portions and non-light transmission portions would have been obvious to one of ordinary skill in the art in view of Yang et al. The Examiner recommends filing a CFR 1.132 affidavit showing unexpected results for the claim range of grain size compared to the prior art disclosures, otherwise the rejections would be maintained."

As noted by Applicants during the in-person office interview, the extrapolation of the width based on the length of 0.7 μm, as shown in FIG. 3C of Jung '493, is based a faulty premise that such a width is in fact smaller than the demonstrated length of 0.7 μm, or any where within the range of 0.2 μm - 0.6 μm, as defined in Applicants' claims 1, 3 and 13-14. Moreover, no where in FIG. 3C or anywhere else is there any reference to the "width of the

overlapping region during crystallization corresponds to the distance, and is varied from no less than 0.5 µm to 2 µm" as defined in Applicants' claims 1, 3 and 13-14.

Nevertheless, in the interest of expedition, a 37 CFR §1.32 affidavit shall be prepared and submitted in due course to overcome such a rejection.

Lastly, claims 6-10 have been rejected under 35 U.S.C. §103 as being unpatentable over Jung, U.S. Patent No. 6,825,493 and further in view of Yang, U.S. Publication No. 2002/0197759 for reasons stated on pages 4-6 the final Office Action. For reasons discussed previously, Jung '493 does **not** disclose or suggest features of Applicants' base claims 1 and 13. Moreover, neither Jung '493 nor Yang, U.S. Patent Application Publication No. 2002/0197759, as a secondary reference, discloses or suggests what the Examiner alleges, that is, the use of a mask provided with at least a light transmission region for passing a laser beam and a laser non-transmission region for blocking the laser beam, wherein <u>the laser transmission region is wider than the laser non-transmission region by more than 1 µm</u>, as defined in base claim 6. The use of such a mask is particularly important to achieve the "<u>width of the overlapping region during crystallization ... is varied from no less than 0.5 µm and 2 µm</u>" as defined in base claim 6.

In contrast to Applicants' base claim 6, Yang '759 only discloses the use of a completely different mask 100, as shown in FIG. 8, in which two different types of light transmission regions L and M are utilized, each having a tiered echelon formation outline. Namely, as described in paragraph [0067] of Yang '759, the light transmission regions L and M have tier-shaped top and bottom outlines. Each of first light transmission regions L is comprised of first to fourth rectangular-shaped patterns, all having the same width. The second light transmission region M, located between the first light transmission regions L, has rectangular-shaped patterns M1 and M2.

Again, the mask 100 as disclosed by Yang '759 is very different from the mask as defined by Applicants' base claim 6, in which <u>the laser transmission region is wider than the laser non-transmission region by more than 1 µm</u>. In view of these distinctions, Applicants respectfully request that the rejection of claims 6-10 be withdrawn.

In view of the foregoing amendments, arguments and remarks, all claims are deemed to be allowable and this application is believed to be in condition to be passed to issue. Should any questions remain unresolved, the Examiner is requested to telephone Applicants' attorney at the Washington DC office at (202) 216-9505. Applicants respectfully reserve all rights to file subsequent related application(s) (including reissue applications) directed to any or all previously

claimed limitations/features which have been amended or canceled, or to any or all limitations/features not yet claimed, i.e., Applicants have no intention or desire to dedicate or surrender any limitations/features of the disclosed invention to the public.

To the extent necessary, Applicants petition for an extension of time under 37 CFR §1.136. Please charge any shortage of fees due in connection with the filing of this paper, including extension of time fees, to the Deposit Account of Stein, McEwen & Bui, LLP, No. 503333, and credit any excess fees to said deposit account.

Respectfully submitted,

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